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DSME to Improve Self-Care and Self-Efficacy in Type 2 Diabetes: A Quasi-Experimental Study

Nurhasanah Sutan Tanamas[1], Herlina Jusuf[2], Gusti Pandi Liputo[3*]
[1,3] *Department of Nursing Science, Faculty of Sport and Health, Gorontalo State University*
Jl. Jenderal Sudirman No. 06 Gorontalo City 96128, Indonesia
[2]*Department of Public Health, Faculty of Sport and Health, Gorontalo State University*
Jl. Jenderal Sudirman No. 06 Gorontalo City 96128, Indonesia

** Corresponding Author. Email: gusti@ung.ac.id*

ABSTRACT

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease requiring comprehensive management to prevent complications. Despite structured care programs, patients often exhibit inadequate self-care and low self-efficacy. This quasi-experimental study aimed to evaluate the effect of Diabetes Self-Management Education (DSME) on self-care practices and self-efficacy among T2DM patients at Kabila Health Centre, Gorontalo, Indonesia. A non-randomized control group pretest-posttest design was employed involving 170 respondents equally divided into intervention (n=85) and control (n=85) groups through simple random sampling. The intervention group received DSME over one week using tailored educational materials for elderly participants, while the control group received standard Prolanis care. Outcomes were measured using validated self-care and self-efficacy questionnaires before and after the intervention. Data were analyzed using Wilcoxon and Mann-Whitney tests. The results demonstrated a significant improvement in self-care (p=0.000) and self-efficacy (p=0.000) scores in the intervention group compared to the control group. DSME was found to be effective in enhancing diabetes management behaviors and confidence among patients. These findings support integrating DSME into routine care to optimize patient outcomes and prevent long-term complications. Healthcare providers are encouraged to adopt structured DSME interventions as part of comprehensive chronic disease management strategies.

Keywords:
Type 2 Diabetes; DSMESelf-Care; Self-Efficacy; Diabetes Education; Non-Pharmacological Intervention; Prolanis

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1. Introduction

Diabetes mellitus occurs when the body cannot utilize insulin effectively or when the pancreas fails to produce sufficient amounts of insulin. This hormone is essential for regulating blood glucose levels [1]. According to the American Diabetes Association (2021), type 2 diabetes mellitus is primarily caused by insulin resistance, which leads to a progressive decline in β-cell insulin secretion. Contributing factors include lifestyle habits, irregular dietary patterns, genetic predisposition, and other metabolic conditions [2].

Globally, type 2 diabetes mellitus affects approximately 422 million people, with the highest burden observed in low- and middle-income countries. Each year, diabetes directly accounts for approximately 1.5 million deaths worldwide [3]. The disease predominantly affects individuals in the productive age group (52.1%) and the elderly population (48.9%) [4].

According to data from the Gorontalo Provincial Health Office (2024), a total of 10,735 individuals have been diagnosed with diabetes mellitus in the province. Among these, Bone Bolango Regency has the highest prevalence, with 3,574 cases. Specifically, Kabila Health Centre recorded 425 individuals diagnosed with diabetes mellitus in 2024.

Effective disease management is essential to prevent the progression and complications of diabetes. Prior studies have classified diabetes complications into two types: acute complications, such as diabetic ketoacidosis and diabetic coma, and chronic complications [5]. These adverse outcomes are often linked to complex treatment regimens that may not align with patients' understanding or behavior, resulting in poor adherence to self-care practices [6].

Based on observational data collected by the researchers at Kabila Health Centre on 12 September 2024, several patients reported limited knowledge about self-care. This was evident in behaviors such as infrequent glucose monitoring (once a month or only when symptoms arise), lack of dietary regulation, poor food choices when eating outside, and limited physical activity [7]. Additionally, some patients reported not adhering to prescribed medication regimens choosing instead to store the medication or refuse it entirely, as they believed their blood sugar levels were not dangerously high or denied their diagnosis of diabetes mellitus.

Therefore, this study aims to evaluate the effectiveness of Diabetes Self-Management Education (DSME) in improving self-care and self-efficacy among patients with type 2 diabetes mellitus, particularly in response to the knowledge gaps and poor management behaviors observed in the local healthcare setting [8].

2. Methods

Study Design

This study employed a quasi-experimental design with a non-randomized control group pretest-posttest approach. This design was selected to accommodate ethical considerations, as withholding educational interventions from patients in clinical settings is inappropriate and impractical in chronic disease care.

Population and Sample

The study population included 292 patients diagnosed with type 2 diabetes mellitus enrolled in the Prolanis (Chronic Disease Management Program) at Kabila Health Centre. A total of 170 respondents were selected through simple random sampling and were evenly distributed into the intervention group (n = 85) and the control group (n = 85).

Intervention

The intervention group received Diabetes Self-Management Education (DSME) for one week. The program included education on blood glucose monitoring, dietary regulation, physical activity, foot care, and medication adherence. The sessions utilized PowerPoint presentations and printed leaflets tailored for elderly patients, using large fonts and visual aids to improve comprehension. The control group received standard care under the Prolanis program, consisting of routine clinic visits and general diabetes counseling.

Data Collection

Data were collected using validated questionnaires to assess self-care behavior and self-efficacy levels. These instruments were administered to both groups before and after the intervention. The instruments had been previously validated in similar populations and were shown to have good reliability.

Data Analysis

Statistical analysis was conducted using non-parametric tests. The Wilcoxon signed-rank test was used to assess within-group differences (pre-test vs. post-test), while the Mann-Whitney U test was used to compare the post-test outcomes between the intervention and control groups. The use of non-parametric analysis was appropriate due to the ordinal nature and non-normal distribution of the data. A p-value of less than 0.05 was considered statistically significant.

3. Results and Discussion

Characteristics of Respondents

This section presents the findings of the study, including the baseline characteristics of the respondents, changes in self-care and self-efficacy before and after the intervention, and the statistical significance of the DSME program. The results are interpreted in relation to previous research and theoretical frameworks relevant to diabetes self-management.

As shown in **Table 1**, the majority of respondents in both groups were female, comprising 82.4% of the control group and 80% of the intervention group. This finding is consistent with prior studies suggesting that women particularly those in older age groups have a higher prevalence of type 2 diabetes mellitus (T2DM), which may be influenced by hormonal changes, physical inactivity, and dietary factors [5].

Table 1. Characteristics of Respondents by Gender, Age, and Duration of Illness

Variable	Category	Control Group (n=85)	Intervention Group (n=85)
Gender	Male	15 (17.6%)	17 (20.0%)
	Female	70 (82.4%)	68 (80.0%)
Age	49–59 years	39 (45.9%)	45 (52.9%)
	60–74 years	41 (48.2%)	39 (45.9%)
	75–90 years	5 (5.9%)	1 (1.2%)
Duration of Illness	1–5 years	47 (55.3%)	49 (53.4%)
	6–10 years	27 (31.8%)	31 (36.5%)
	11–15 years	8 (9.4%)	5 (5.9%)
	16–20 years	3 (3.5%)	0 (0.0%)

Source: primary data 2025

Note: Percentages are based on group totals (n = 85). Age classification follows WHO criteria: 49–59 years (pre-elderly), 60–74 years (early elderly), and 75–90 years (late elderly).

In terms of age distribution, the largest proportion of participants in the intervention group were aged 49–59 years (52.9%), while in the control group, the highest proportion was aged 60–74 years (48.2%). This age pattern reflects national epidemiological data, indicating that T2DM is most prevalent among individuals in middle and late adulthood [1].

With regard to the duration of illness, more than half of the respondents in both groups had been living with T2DM for 1–5 years (55.3% in the control group and 53.4% in the intervention group). This relatively early stage of the disease is considered ideal for implementing behavioral interventions such as DSME, as patients are generally more receptive to adopting new self-management practices during this period [4].

Effect of DSME on Self-Care Before and After the Intervention

The effect of Diabetes Self-Management Education (DSME) on self-care behavior was evaluated using the Wilcoxon signed-rank test for both control and intervention groups. As shown in **Table 2**, the control group demonstrated a statistically significant difference in self-care scores before and after receiving standard care (Prolanis), with a p-value of 0.002 ($p < 0.05$). Although this indicates a positive change, the improvement was relatively modest.

Table 2. Wilcoxon Test of Self-Care in Control Group

Comparison	N	Mean Rank	Z	Asymp. Sig. (2-tailed)
Negative Ranks	16	36.69	-3.124	0.002
Positive Ranks	47			
Ties	22			
Total	85			

Source: primary data 2025

In contrast, the intervention group showed a more substantial improvement in self-care behavior following the DSME intervention. The Wilcoxon test yielded a p-value of 0.000 ($p < 0.05$), indicating a highly significant change (**Table 3**).

Table 3. Wilcoxon Test of Self-Care in Intervention Group

Comparison	N	Mean Rank	Z	Asymp. Sig. (2-tailed)
Negative Ranks	0	36.69	-8.009	0.000
Positive Ranks	85			
Ties	0			
Total	85			

Source: primary data 2025

Before the DSME intervention, none of the respondents in the intervention group demonstrated good self-care. Specifically, 66 respondents were classified as having poor self-care, and 19 as moderate. After one week of DSME sessions, 3 respondents achieved good self-care, 81 were moderate, and only 1 remained in the poor category. This marks a significant behavioral improvement attributable to the structured DSME program.

For comparison, the control group, prior to receiving only standard Prolanis care, had 1 respondent with good self-care, 29 moderate, and 55 poor. After one week, this changed to 1 good, 48 moderate, and 36 poor. The modest shift may be explained by incidental consultations with healthcare workers under Prolanis, which, although limited in scope, may still offer some motivational and informational support.

These results are consistent with findings by Harahap et al. , who suggest that self-care is influenced by multiple factors, including knowledge, self-efficacy, family support, and emotional states. Additionally, Bukhsh et al. [8] emphasize the importance of structured health education and familial involvement in improving self-care adherence among T2DM patients.

The significant gains observed in the DSME group may be attributed to the program's educational content, which included practical guidance on blood glucose monitoring, healthy eating, physical activity, and foot care. This is further supported by Amalia and Nursyamsi [9], whose study applying DSME based on a health coaching model in Bulukumba Regency resulted in improved self-care scores and clinical outcomes such as HbA1c, total cholesterol, and blood pressure.

Taken together, the data confirm that there is a clear difference in self-care outcomes between the control and intervention groups. The DSME intervention was significantly more effective, as indicated by the respective p-values (0.002 in the control

group and 0.000 in the intervention group), and by the magnitude of behavioral change observed post-intervention.

Effect of DSME on Self-Efficacy Before and After the Intervention

The effect of Diabetes Self-Management Education (DSME) on self-efficacy was analyzed using the Wilcoxon signed-rank test. In the control group, a statistically significant improvement in self-efficacy was observed after one week of standard care, with a p-value of 0.000 ($p < 0.05$), as shown in **Table 4**. However, the magnitude of change was relatively limited.

Table 4. Wilcoxon Test of Self-Efficacy in Control Groupin Puskesmas Kabila control group

Comparison	N	Mean Rank	Z	Asymp. Sig. (2-tailed)
Negative Ranks	0	0.00	-6.378	0.000
Positive Ranks	52			
Ties	33			
Total	85			

Source: primary data 2025

The intervention group, which received DSME, showed a more pronounced improvement. All 85 respondents had positive rank changes, indicating higher self-efficacy scores post-intervention. The Wilcoxon test yielded a p-value of 0.000, confirming a statistically significant difference (**Table 5**).

Table 5. Wilcoxon Test of Self-Efficacy in Intervention Group

Comparison	N	Mean Rank	Z	Asymp. Sig. (2-tailed)
Negative Ranks	0	0.00	-8.015	0.000
Positive Ranks	85			
Ties	0			
Total	85			

Source: primary data 2025

Prior to DSME, the control group had 2 respondents with high self-efficacy, 61 with moderate, and 22 with low. After standard care, the number of respondents with moderate self-efficacy increased to 72, while those with low self-efficacy decreased to 11. This modest change may be attributed to informal counseling or motivation from healthcare providers during Prolanis activities.

Self-efficacy is influenced by vicarious experience, verbal persuasion, and one's physiological and emotional state. Patients in the control group may have gained limited confidence through routine interactions, yet the absence of structured education likely constrained their progress [10].

Moreover, disease duration appeared to impact self-efficacy. Respondents with T2DM for more than 5 years generally had moderate to low self-efficacy. This finding aligns with research by Dwitanta [11], which found that self-efficacy tends to decline after 5–10 years of diabetes, especially when complications emerge.

In the intervention group, prior to DSME, only 4 respondents had high self-efficacy, 50 were moderate, and 31 were low. After the DSME intervention, 59 respondents were classified as having high self-efficacy, 26 as moderate, and none as low. These results demonstrate the effectiveness of DSME in strengthening patients' confidence and capacity to manage their condition.

The increase in self-efficacy is attributed to the content and format of the DSME sessions, which included PowerPoint slides and printed materials designed for elderly patients. Large fonts, visual elements, and practical examples made the information more accessible. Similar findings were reported by Lamen et al. [12] who used animated video media to deliver DSME and observed a shift from 70% moderate and 26.7% low self-efficacy scores to 100% high post-intervention.

These findings suggest strong alignment between theoretical frameworks and empirical outcomes. Both groups experienced improvements, but the intervention group achieved significantly greater progress, with p-values of 0.000 in both cases confirming statistical significance.

Effect of DSME on Self-Care and Self-Efficacy Between Groups

The impact of Diabetes Self-Management Education (DSME) was further evaluated by comparing the post-intervention outcomes between the intervention and control groups using the Mann-Whitney U test.

As shown in **Table 6**, the mean rank for self-care in the intervention group (127.84) was significantly higher than that in the control group (43.16), with a Z-value of -11.239 and a p-value of 0.000 ($p < 0.05$). This result indicates a statistically significant difference in self-care scores between the two groups following the intervention.

Table 6. Mann-Whitney U Test of Self-Care Scores

Group	N	Mean Rank	Z	Asymp. Sig. (2-tailed)
Control	85	43.16	-11.239	0.000
Intervention	85	127.84		

Source: Primary data, 2025

This finding confirms that the DSME intervention significantly enhanced self-care capabilities among patients with type 2 DM. The educational content—delivered through visual aids and elderly-friendly formats—proved effective in improving patients' daily self-care practices, including glucose monitoring, dietary regulation, physical activity, and foot care. These findings are supported by Putra and Mahira [13], who found that DSME delivered via animated videos and social media platforms increased patients' knowledge and adherence to daily self-care routines.

Furthermore, previous research by Lamen et al. [12] reported similar results, where structured DSME improved self-care scores by up to 35% in domains such as diet, glucose monitoring, and foot hygiene. In the present study, patients who initially lacked any knowledge of diabetic foot care were able to perform proper foot hygiene (e.g., drying between toes, using moisturizers, and wearing appropriate footwear) after DSME exposure.

The analysis also revealed that respondents with longer disease duration (over 10 years) generally reported poorer quality of life prior to the intervention. However, post-DSME, these respondents showed marked improvements in managing their diet, engaging in physical activity, and performing regular blood glucose checks. This is consistent with Orem's Self-Care Deficit Theory [14], which emphasizes the role of knowledge, motivation, and structured education in restoring patients' self-care capabilities.

Similarly, the Mann-Whitney U test for self-efficacy showed a significant difference between the two groups (**Table 7**). The intervention group demonstrated a higher mean rank (127.79) compared to the control group (43.21), with a Z-value of -11.272

and a p-value of 0.000 ($p < 0.05$). This result confirms that the DSME intervention had a substantial impact on improving patients' confidence in managing their illness.

Table 7. Mann-Whitney U Test of Self-Efficacy Scores

Group	N	Mean Rank	Z	Asymp. Sig. (2-tailed)
Control	85	43.21	-11.272	0.000
Intervention	85	127.79		

Source: Primary data, 2025

This difference may be attributed to the content and delivery of DSME, which not only increased knowledge but also encouraged participants to reflect on their condition, find solutions, and take action—thus strengthening their self-efficacy. This aligns with findings by Subkhan et al. [15], who reported that low self-efficacy in T2DM patients is largely due to limited health literacy and lack of structured education.

In addition, research by Derang et al. [16] demonstrated that DSME interventions significantly alter patients' thought processes, enhance self-belief, and improve health behavior. The current study supports this, showing that respondents became more motivated, less apathetic, and more capable of implementing self-care after DSME exposure. In summary, the Mann-Whitney test results validate that DSME significantly improves both self-care and self-efficacy when compared to standard care. These findings are supported by both statistical data and existing literature, reaffirming the importance of integrating DSME into routine diabetes management.

While the results strongly suggest the effectiveness of DSME, this study has several limitations. First, the follow-up period was limited to one week after intervention, which does not capture long-term behavior change or sustainability of self-care practices. Second, the reliance on self-reported measures may introduce response bias. Third, the study was conducted at a single health center, limiting generalizability to broader populations. Future studies should incorporate longer follow-up periods, objective biomarkers (e.g., HbA1c), and multicenter designs to strengthen evidence and applicability.

4. Conclusion

This study demonstrates that Diabetes Self-Management Education (DSME) significantly improves self-care behavior and self-efficacy in patients with type 2 diabetes mellitus at Kabila Health Centre. The intervention group, which received structured and age-appropriate educational materials, showed substantially greater improvements than the control group receiving standard care. These findings highlight the importance of integrating DSME into routine clinical practice, particularly within national chronic disease management programs such as Prolanis. By enhancing patients knowledge, confidence, and self-management abilities, DSME can contribute to better glycemic control and prevention of long-term complications. Future research should explore the sustainability of these outcomes over time, assess cost-effectiveness, and adapt educational approaches to diverse cultural and literacy contexts.

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Conflicts of Interest:

The authors declare no conflicts of interest in relation to the design, implementation, or publication of this study.

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